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mud, in which they are supported,—*Holtenia* by a delicate maze of siliceous fibres, which spread round it in all directions, increasing its surface without materially increasing its weight,—*Hyalonema* by a more consistent coil of spicules, which penetrates the mud vertically and anchors itself in a firmer layer.

It appeared to the author and to Dr. Carpenter, who had had their attention specially directed to this point as bearing upon the continuity and identity of some portions of the present calcareous deposits of the Atlantic with the cretaceous formation, that the vitreous sponges are more nearly allied to the *Ventriculites* of the chalk than to any recent order of Porifera. They are inclined to ascribe the absence of silica in many ventriculites, and the absence of disseminated silica in the chalk generally, to some process, probably dialytic, subsequent to the deposit of the chalk, by which the silica has been removed and aggregated in amorphous masses, the chalk flints.

The Vitreous Sponges along with the living Rhizopods and other Protozoa which enter largely into the composition of the upper layer of the chalk-mud, appear to be nourished by the absorption through the external surface of their bodies of the assimilable organic matter which exists in appreciable quantity in all sea-water, and which is derived from the life and death of marine animals and plants, and in large quantity, from the water of tropical rivers. One principal function of this vast sheet of the lowest type of animal life, which probably extends over the whole of the warmer regions of the sea, may probably be to diminish the loss of organic matter by gradual decomposition, and to aid in maintaining in the ocean, the "balance of organic nature."

XVIII. "An Inquiry into the Variations of the Human Skull, particularly in the Antero-posterior Direction." By JOHN CLELAND, M.D., Professor of Anatomy and Physiology, Queen's College, Galway. Communicated by Dr. ALLEN THOMSON. Received June 15, 1869.

(Abstract.)

1. A method of notation is suggested by which material sufficient for the formation of a perfectly accurate diagram of a skull may be registered by means of a line or two of figures. This is accomplished by marking the vertical and horizontal distance of a number of points from the postauricular depression.

2. The longest base-lines, from fronto-nasal suture to back of foramen magnum, are found in savage skulls. This base-line is distinctly longer in males than females; and the proportion which the arch bears to the base-line is greater in children than in the adult. In the Irish, the base-line is short, and the arch extensive.

3. The mesial base being considered in three parts, viz. length of

foramen magnum, orbital length or profile distance of fronto-nasal suture from foramen opticum, and the foramino-optic line uniting the other lines together, it is found that the long base-line of savage skulls depends both on amount of orbital length and on long foramino-optic line.

4. The angle at which the line of orbital length lies to the foramen magnum is distinguished as the cranial curvature. This angle in adult Europeans on an average exceeds  $180^{\circ}$ , and in negro and other savage types falls short of that amount. It is also less in infants than in adults, and greater in females than in males. But the variation of the angles at which the foramen magnum and orbital depth respectively lie to the foramino-optic line, is much greater than the variation in cranial curvature; therefore the two angles mentioned are in a certain degree of mutual relation; and according to their size, the base may be termed "steep" or "level." The infant base is much more level than the adult male base; the levelness of childhood sometimes persists in the female.

5. The different regions of the arch do not grow equally. The parietal region reaches its greatest predominance in the last month of foetal life, and after birth the frontal region grows most rapidly, and the occipital region next most rapidly. There is no foundation whatever, so far as mesial measurements are concerned, for the supposition that the lower races of humanity have the forehead less developed than the more civilized nations. Neither is it the case that the forehead in the lower races slopes more backwards on the floor of the anterior cranial fossa than it does in others.

6. The local prominence of different parts of the arch of the skull being measured by means of the angles joining lines passing from point to point in the arch, it is shown that the angles furnish a means of collecting various precise details with regard to national characteristics of form, from which important results may be expected if the plan be worked on an extensive scale. Flatness of the angle formed by lines from the extremities to the midpoint of the parietal arc is shown to be correlated with length of base-line.

7. As age advances, "gravitation changes" take place, the base being driven in and the lateral wall bulging out, the forehead becoming more retreating, and the condyles flat.

8. It is sought to be shown that if Dolichocephali and Brachycephali are to continue to be a natural and not an artificial division of skulls, the distinction must be based on the various characters pointed out by Retzius, and not on the mere amount of the "cephalic index." The proportion of height to length, according to the writer, is more important than the proportion of breadth to length. He proposes that Hindoo skulls should be considered as belonging to a subdivision Brachycephali angustiores, and that the Germans should be considered as Dolichocephali latiores.

9. The value of "radial" measurements from the postauricular depression is tested, and it is shown that a classification of some value may be based on them, but that they are defective in consequence of the variability

of the position of the postauricular depression, in both vertical and horizontal direction, as compared with the front of the foramen magnum. That position varies in different races, and is affected by gravitation changes.

10. The position of greatest breadth varies according to the time of life, and as the spaces adjacent to the mesial and lateral roof-ridges are well filled or ill filled; and an hypothesis is advanced in explanation of this, and of the mesial ridge being prominent in savage skulls, although the ridge on the foetal skull disappears in childhood.

11. Orthognathism and prognathism are shown to be concrete results of a variety of circumstances, some of them not connected with the anatomy of the face, as, for example, the degree of cranial curvature. The extent to which the face projects from underneath the skull must be measured by an angle contained between the fore part of the face and the floor of the anterior fossa only of the skull, the curves of the base of the skull further back having really nothing to do with the matter. This projection of the face is great in French skulls, considerable in Scotch, and small in Irish and German skulls.

12. The facial angle is affected by the height of the ear above the foramen magnum, while prognathism is not.

13. The condyles of the skull become more and more prominent in front from infancy to adult life, and thus tilt the skull more and more backwards. By this rotation balance is preserved, seeing that the fore part of the head and the face are the parts which proportionally increase in size as growth proceeds, and their increased proportion of weight is made up for by a greater amount being thrown behind the vertebral column. There is less tilting back in the female head than the male.

14. This principle is shown to be most important in Artistic Anatomy.

15. In the lower animals the cerebral curvature is of very different amount in different species, the most advanced animals having it greatest.

XIX. "Researches on Vanadium."—Part II. By HENRY E. ROSCOE, B.A., Ph.D., F.R.S. Received June 16. Read June 17, 1869.

(Abstract.)

*On the Chlorides of Vanadium and Metallic Vanadium*

In the first part of these researches ('Bakerian Lecture,' Phil. Trans. 1868, pt. i.) the author stated that the chlorides of vanadium, and probably also the metal itself, could be prepared from the mononitride, the only compound of vanadium not containing oxygen then known. The process for obtaining the mononitride described in the last communication was that adopted by Berzelius for preparing the substance which he conceived to be metal, but which in reality is mononitride. This method consists in the action of ammonia on the oxitri-chloride; but it cannot be